DOCUMENT RESUME

ED 217 966 PS 012 847

AUTHOR Chafel, Judith A.; Olmsted, Judith
TITLE Taking Math Beyond Counting in Preschool: Thinking About the Same Object, Different State!
PUB DATE May 82
NOTE 19p.; Paper presented at the Annual Meeting of the Midwest Association for the Education of Young Children (Indianapolis, IN, May 6-8, 1982).

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Change; *Concept Formation; *Learning Activities; *Object Permanence; *Preschool Children; Preschool Education; *Teaching Methods
IDENTIFIERS *Piagetian Theory

ABSTRACT

In order to help preschool children understand mathematical principles, five different learning activities designed to help them think about physical transformation or change are described. Introductory remarks focus on Piaget's concept of transformation and on various strategies teachers can use to help children consider changes in the state of an object. Suggested strategies include preparing the environment with a variety of materials, parallel play, modelling, questioning, and conflict inducement. The specific learning activities discussed are sand play, play dough, shadows, painting, and the use of a silhouette sorter (a sorting box with holes of various shapes cut from its surface into which children can place corresponding blocks). (RH)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED217966

TAKING MATH BEYOND COUNTING IN PRESCHOOL: THINKING ABOUT THE SAME OBJECT, DIFFERENT STATE!

Judith A. Chafel
Assistant Professor
Indiana University (Bloomington)

and

Judith Olmsted
Director
Hoosier Courts Cooperative Nursery School

TEXT	SUPPORTING MATERIALS

We welcome you.

Before we begin to "take math beyond counting," we'd like you to think about your preschool classroom and the math activities you provide for your children. Maybe you have a "Number-ite" set like this.

[SHOW NUMBER-ITE CARDS TO AUDIENCE.]

Or you might have "Unifex" cubes like these.

[SHOW UNIFEX CUBES IN HOLDER.]

ASK AUDIENCE:

What early math materials are available in your classrooms? What kinds of math activities do you plan with them?

[AUDIENCE RESPONDS]

These are all good activities--learning to count and recognize numerals are an important part of a child's early math experiences.

HOWEVER, we feel that there is far more that teachers can do for young children in this important area--although we do recognize

Annual Meeting of the Midwest Association for the Education of Young Children
Indianapolis, Indiana
May 8, 1982

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

X This document has been reproduced as received from the person or organization originating it.
Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Judith A. Chafel
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

PS012847

TEXT	SUPPORTING MATERIALS

that young children feel a sense of satisfaction and accomplishment when they master counting activities.

One way of "taking young children beyond counting in preschool is by drawing upon Piaget's concept of transformation (or change). In their preschool curriculum entitled CONSTRUCTIVE PLAY: APPLYING PIAGET IN THE PRESCHOOL, George Forman and Fleet Hill have designed activities for young children to help them think about physical transformation or change.

During our presentation this afternoon, we are going to show you five different activites, drawn from Forman and Hill's curriculum. The activities were implemented successfully at the Hoosier Courts Cooperative Nursery School in Bloomington, Indiana. The activities with materials include:

1. sand play
2. play dough
3. shadows
4. painting
5. silhouette sorter

TEXT	SUPPORTING MATERIALS
The activities are very consistent with the theme of this conference, "Roads to Responsible Adulthood." Because the ability to think about change is an essential mental activity. We believe that young children who are sensitive to change in their every day world are likely to be flexible, able to make choices and to invent solutions to problems they encounter. They will be prepared--as future adults--to modify their environment to meet the challenges that are constantly being presented by our rapidly changing society. Before we describe the activities for you, we need to talk briefly about Piaget's concept of <u>transformation</u>, and the various strategies that teachers can use to help children consider changes in the same object, different state. Very briefly--Piaget views change as being virtually synonymous with cognitive development. According to Piaget, knowledge is constructed by learning how objects move, how they change shape and position, and how they change in relation to themselves and	

TEXT	SUPPORTING MATERIALS
other objects. For example, an infant learns that when an object changes position, the identity of that object doesn't change. A favorite toy for an infant--turned around and viewed from the rear--is still the same toy that was seen a few minutes earlier from the front. The infant demonstrates that he or she recognizes the boy from the new perspective by grasping it and, then, immediately rotating it back into a more familiar state. Even though the object has changed position, it is still the same toy. In the early stages of development, an infant may have no idea that these rotations represent variations of the same object. The child will gaze at the old object from a different perspective as if it were a new toy altogether. Merely looking closely at a favorite toy from the new perspective is not enough for the child to understand the connection between the two objects. The child gradually constructs this relation--that the same object is in a different state--with experience. He or she needs to <u>transform</u>	

TEXT	SUPPORTING MATERIALS

the object--that is, move it through space while observing shifts in state from the different perspectives and reversing the shifts back to the object's original state. (conservation)

What implications does Piaget's concept of transformation have for early childhood educators? Teachers can guarantee that young children in their classrooms have the opportunity to deal with many different kinds of change--to apply the same actions to different objects, to view an object from different perspectives, and so on. Forman and Hill point out that the best way to reach this goal is by structuring the curriculum. Curriculum can be structured by allowing a maximum degree of freedom for children to

1. vary their actions on physical objects;
2. set their own problems;
3. ask their own questions;
4. generate their own cognitive conflicts (or confusions).

Teachers can use a variety of teaching strategies to help children construct transformations with physical objects. These teaching strategies are:

TEXT	SUPPORTING MATERIALS
1. preparing the environment--setting out a variety of materials to maximize children's learning encounters; 2. parallel play -- playing alongside children, not engaging in any interactions with them, but watching them and trying to sense the goals in their play; 3. modelling -- imitation is one of the basic ways in which children learn. When an adult imitates a preschool child, the child will be stimulated--in turn--to imitate the adult. This means that a teacher can enter the flow of a child's play, shifting its direction, so that the child begins to imitate the teacher. In this way, the teacher can introduce new challenges into the child's play. 4. questioning -- asking children questions that are designed to help them think about change. For example, asking children,	

TEXT	SUPPORTING MATERIALS

"What will this . . . look like if you bend it here?" . . . if you twist it? . . . if you turn it around? . . . etc. or "What can we do to make this one like that one?" is better than asking, "Tell me how these two objects are different." or "What do we call this?

Teachers can ask children questions to help them make <u>transformations</u> on objects--thereby becoming active agents of change. These are all questions related to

changing the nature, function, appearances of things, focusing on the process of change of state of materials, persons or events. Inferring is a part of this--the prediction of what will happen relating to a change of state.

5. conflict inducement --

the teacher can create situations that lead children to think that something is not "quite right." The children will want to construct relevant knowledge in order to reduce the conflict.

TEXT	SUPPORTING MATERIALS
On the slides that we are going to show you, you will see preschool children at the Hoosier Courts Cooperative Nursery School engaged in problem solving encounters with the same object, different state. We will point out to you developmental differences between the older and younger children in their actions on the various objects. We will also explain strategies that the teacher used to stimulate and extend the children's play. SLIDES BEGIN HERE. 1. SAND PLAY: (SHOW MATERIALS) The children should be encouraged to congregate naturally at the sand table. The teacher can engage in parallel play--playing alongside the children, not making any comments, but watching them and trying to sense their goals. This slide shows the teacher pouring sand into a funnel. A child stopped to watch and then began pouring sand with a shovel into a funnel. Another child came over to join the activity and also began pouring sand into a funnel! (parallel play)	

TEXT	SUPPORTING MATERIALS
The younger children were fascinated with perceptual qualities of the sand. They engaged in actions, such as pouring, shovelling, filling, levelling, mounding, dumping, patting, smoothing, and so on. The teacher poured some sand into a container and filled it. A three-year-old began levelling sand in the same container saying, "Up!" The child continued to pour the sand, while the teacher poured, too. The teacher then said, "Down . . . down-up!" She poured the sand down through a funnel and it flowed up over the top of the container. In this picture, a three-year-old is pressing down into the sand with a sifter. He watches as the sand comes up through the holes--not down as usually happens. The older children engaged in more representational play with the sand, and reversed their actions. The four-year-olds were very interested in making "something" (a cake, pie, strawberries, etc.!) One child said, "Two cups . . . , as she worked, ticking off words from a recipe. Another child (the same age) used an empty tin can to make a cylindrical-shaped mold.	

TEXT	SUPPORTING MATERIALS
He showed the teacher his product. Then, he went "W-o-o-sh!" and flattened the sand. He fit the can back over the mold before flattening it--demonstrating the concepts of reversibility and transformation.	
The teacher tried to instigate cognitive conflict among the children. She presented the children with different containers and funnels of various sizes. She asked them, "If I have the larger container, can I fill mine faster than yours?" "How else can we fill it fast?" The problem can be posed using different variables: size of container, size of hole in funnel, speed of filling.	
PLAY AUDIOTAPE OF QUESTIONING STRATEGIES HERE.	
II. SHADOWS: (SHOW MATERIALS)	
The teacher can begin the activity by making shadows with the children.	
The younger children became very interested in making shadows, using their own bodies or objects in the environment.	
The teacher asked questions to extend their play: "What else can we use (to make a shadow)?" "What happends when you move up close . . . farther away?" "Can you make the	

TEXT	SUPPORTING MATERIALS
shadow smaller . . . bigger . . . ," and so on. One three-year-old moved close to the screen and then farther away, observing changes in a shadow. The children can observe transformations (that is, changes) in appearance between objects held in front of a screen (they are smaller) and those placed on a surface, such as an overhead projector (they are larger). It's still the same object that's making the shadow! The older children, by contrast, experimented more with alternative ways of making a shadow, observing relations between the same object, different state. One four-year-old turned an orange juice can upright and then rolled it on its side. He observed two different perspectives for making a shadow, using the same object. It's still orange juice! In this slide, the teacher asked a four-year-old, "How can we make our snowman kiss?" The child made the objects come together, not the shadows!	

TEXT	SUPPORTING MATERIALS

(coordinating relations between objects and shadows)

The teacher asked another four-year-old, "Can my snowman take a ride on the polar bear?" She moved the shadows close together on the screen. The child emphatically said, "NO!" He then moved the toy objects together on the surface of the overhead projector.

III. PLAY DOUGH: (SHOW MATERIALS)

The teacher can prepare the play dough ahead of time or make it with the children, as a group activity. The actions of pouring and stirring ingredients can be managed with even very young children. They can, then, observe transformations in the materials from dry to moist ingredients. The play dough can then be set out in shallow bowls or a large batch of it can be rolled out on the surface of a table.

The children will spontaneously engage in "free-form scupting" or "rolled-out imprinting", using the various objects that the teacher has set out.

The younger children were very interested in manipulating the medium, as well as observing

TEXT	SUPPORTING MATERIALS
the perceptual qualities of the material. One three-year-old rolled some play dough out with a rolling pin and said, "It's getting bigger!" The same child pressed a star cut-out into a piece of play dough. The teacher asked, "How can we make the star bigger?" The child rolled over the play dough with the rolling pin. In this example, the teacher said to a child, "Big!", as she pressed into a large mound of play dough. The child pulled off pieces from it and replied, "Small!" He patted the pieces onto his own pile of play dough, looked at it and announced, "Big!" The teacher stretched a mound of play dough saying, "It's bigger!" A child who watched her squeezed it and said, "It's small!" (meaning smaller). The older children were interested in creating a <u>realistic product</u> with the material. The teacher gave a five-year-old a piece of play dough and took one herself saying, "You play with yours and I'll play with mine!" She rolled hers out and placed it next to the	

TEXT	SUPPORTING MATERIALS

child's. The child said, "That's big!" The child flattened the play dough and said, "We're making the biggest taco in the world!" (parallel play)

The teacher modelled for the children: "I'm going to make a little star and see what I can do! What happens when I roll over it?" A four-year-old replied, "It's going to get smaller!" Conversely, a five-year-old answered, "It's going to get bigger!" (making predictions).

IV. PAINTING: (SHOW MATERIALS)

The children can take a piece of colored paper, cut a hole in the center, with the teacher's help, and place their stencil over another piece of colored paper. They can then brush over the stencil, leaving colored paint on the colored paper.

The younger children were interested in creating a finished product, rather than experiencing the transformation of colors. The teacher asked a three-year-old, "Do you want to make an orange balloon?" The child took a blue stencil and placed it on top of the orange paper. The teacher said, "You

TEXT	SUPPORTING MATERIALS

made an orange balloon!" The child nodded, "Yes." Another child looking on replied, "No, you didn't. You need to use the orange paint.

Conversely, the older children became intrigued with contrasts between the colors. They reversed the colors to create changes of effect (for example, orange on blue and blue on orange). Their play was far more purposeful than the younger children's.

A five-year-old placed a blue stencil on top of an orange piece of paper and said, "If I put these together, I'll have one side blue and one side orange. After painting with the stencils, the child cut out circles showing orange on one side and blue on the other and announced, "Now, I have an orange balloon and a blue balloon!"

V. SILHOUETTE SORTER (SHOW MATERIALS)

The Silhouette Sorter is a sorting box with holes of various shapes cut from its surface. Connector Blocks can be made to fit into the pre-cut holes.

The children can place Connector Blocks of various shapes through their corresponding holes. The children should be encouraged

TEXT	SUPPORTING MATERIALS

to come naturally to the activity. The teacher can get them started by posing various problems for them to solve.

The younger children were interested in building with the materials. They were inclined to break off pieces from the shapes to make them fit the holes.

The teacher asked the children, "Can you make something go in our box?" A child responded by slipping a stick into a rectangular hole, then sliding a flat rectangle vertically into the same hole.

The teacher then asked, "Does this match?" (SHOW SHAPE HERE)

A child pushed the shape into the hole and it matched the opening. The teacher then handed the same shape to the child in a changed position--reversed and upside down. The child reversed one part of it to fit the opening, and then instead of reversing the other section, took it apart and slid it into the hole! (part-whole relations)

By contrast, the older children studied the configurations, rotated them in space and then matched the object to the holes. They were able mentally to disassemble parts to

TEXT	SUPPORTING MATERIALS
solve problems relating to the same object, different state. The teacher said to the children, "I've got something I want you all to figure out." (SHOW SHAPE HERE) A child took the construction, turned it around and slid it into the opening. (The teacher reflected that if she handed a shape to the child in the matching position--i.e., shape to hole--, it became easier for the children to solve the problem). The teacher asked again, "Can you match this (pointing to shape) to this one (pointing to hole)?" The child grasped the shape, changed the position of one of the pieces to make a fit, but it wasn't a perfect fit, so he started playing with one of the blocks. The teacher then asked, "Can you make this go in here?" (SHOW SHAPE HERE) The child fit the piece to the hole by turning it around in his hands. Finally--the teacher asked a child, "What can go in here? Will this go in here?" (SHOW SHAPE HERE)	

TEXT	SUPPORTING MATERIALS

The child realized that even though the configuration possessed an extension, it could be turned around to make a fit.

To conclude:

1. The activities are designed to help children think about change in their everyday environment. Children who are sensitive to change are likely to be flexible, able to make choices and invent solutions to problems that they encounter. These are all essential mental qualities "on the road to responsible adulthood."

2. We hope that we have stimulated you to try some of these activities in your own classrooms.

3. Many of the activities we've shown you can be implemented with materials that you already have in hand; others may represent new uses for familiar items.

[INVITE AUDIENCE TO EXAMINE MATERIALS ON DISPLAY--DISTRIBUTE HANDOUTS.]